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(54) Title: **WATER BEVERAGE CONTAINING FIBRES**

(57) Abstract: The present invention relates to a water-based beverage containing soluble fibres. The water composition is substantially demineralized and has a neutral or acidic pH. The soluble fibres contained in the present water composition are selected from a group comprising oligosaccharides with a chain length of from about 2 to 20 units and digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000. The present water composition may be store without adverse effect such as hydrolysis of oligosaccharides nor precipitation of the soluble fibres contained in it.

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WATER BEVERAGE CONTAINING FIBRES

The present invention relates to a water-based beverage, which comprises soluble fibres without compromising shelf-
5 stability, appearance, safety, taste as well as nutritional benefits.

Fibres have gain popularity among the past few years due to the large interest of both consumers and food companies
10 for their acknowledged nutritional benefits.

Physiological features and nutritional benefits of fibres are broad. They are considered as having nutritional benefits on the control of glycaemia, on the metabolism of
15 cholesterol and triglycerides, on the gut fermentation through gas production, on the control of the function of the gastro-intestinal tract and are considered as having a prebiotic effect on gut microflora.

20 Dietary fibres are considered to be the soluble and insoluble components of food that are not digested by enzymes in the human gastro-intestinal tract. These fibres include non-starch polysaccharides, (from either vegetal, algae, bacterial or fugal origin) resistant starch as well
25 as lignin and oligosaccharides.

Dietary fibres covers a wide variety of compounds that share the feature of being substantially non digested by gastro-intestinal enzymes in the gut where they are more
30 or less fermented by the local micro-flora.

All dietary fibres have not the same structure nor the same physico-chemical properties and therefore provide different health benefits. Insoluble dietary fibres, such as cellulose and hemicellulose, are excellent for decreasing the transit time of food through the digestive tract. On the other hand some soluble and very viscous fibres like guar gum and β -glucans have effect on glycaemia and some non-viscous ones like fructo-oligosaccharides have positive impact on gut fermentation as well as on microflora development.

The primary source of dietary fibres is found in vegetables and cereal products. However nowadays, due to the increase of the consumption of processed-foods, the average daily intake of fibres is decreasing. Therefore there is a trend to complement processed foods with added fibres, whether soluble and/or insoluble. However, supplementation with fibres leads sometime to the problem of imparting a somehow gritty taste to the concerned food products.

Regarding beverages field, some attempts have been done to supplement beverages with fibres. Such beverage may comprise soluble or insoluble fibres and are often in the form of medicinal feeding beverage supplemented with sugar, dyes as well as flavouring and aromas where fibres are suspended and/or dissolved in the liquid phase.

Regarding the supplementation of beverages with fibres, it is not really conceivable to use either viscous or insoluble fibres. Some attempts have been made in order to supplement beverages like soft drinks and clear beverages

with soluble fibres. US 5851578 describes a liquid beverage with soluble fibre added which is buffered with food acids. The beverage is pasteurised. Indeed, since fibres may be fermented by microorganisms like bacteria
5 moulds and fungi, acidification is necessary to prevent fermentation and ensure good shelf-stability. This patent also teaches how to prepare a powder granular mix of the ingredients intended for the reconstitution of the said beverage.

10 However, if the acidification of the beverage can be considered as a good solution to minimize the risks of spoilage, some soluble fibres may undergo hydrolysis into simple sugar under such acidic conditions.

According to prior art the supplementation of fibres to
15 beverage is better to be done just before consumption in order to avoid either spoilage or hydrolysis of soluble fibres.

US 6248390 discloses a water containing fibre. This patent describes the manufacture of such beverage by dissolving
20 the fibres into water and also teaches that the resulting solution may be autoclaved in order to ensure microbial status. However, there are no trials presented in such document referring to autoclaving of such solutions. Indeed, it is suspected that such drastic heat treatment
25 may involve partial hydrolysis of soluble fibres as well as an increase in the Optical Density of the solution. Moreover, currently most of the packaging materials suitable for bottled water are made of plastic such as PET and are not resistant to autoclaving where temperatures
30 above 100°C are applied.

Therefore there remains a need for a clear beverage that contains soluble fibres which does not undergo hydrolysis, that is shelf-stable and that does not compromise taste, mouthfeel and appearance.

5

Accordingly, the present invention is directed to a shelf-stable, clear and neutral pH water composition comprising water and soluble fibres that is characterized by the fact that :

10

-the water is substantially demineralized
-and the soluble fibres comprise oligosaccharides with a chain length of about 2 to 20 units.

15

Surprisingly, it has been observed that the addition of fibres comprising oligosaccharides with a chain length of about 2 to 20 units, preferably 2 to 15 units and more preferable 2 to 8 units allows to obtain a clear water beverage without the drawbacks of the prior products.

20

Chain length is also known as degree of polymerization, DP.

25

Suitable oligosaccharides may be chosen in the group comprising fructo-oligosaccharides made of fructose residues linked by $\beta(2-1)$ bonds. The preferred fruto-oligosacchrides exhibit a chain length of around 2 to 20 fructose units, preferably 2 to 15 units and more preferably 2 to 8 fructose units.

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The quantity of fibres contained in the water composition according to the present invention ranges from 0.1 to 10

gram of fibre per litre of water, preferably from 1 to 7 g/l and more preferably from 2 to 5 g/l.

5 The expression "neutral pH" means that the water composition according to the present invention has a pH ranging from about 5.5 to 8.5, preferably from about 6.5 to 7.5.

10 While neutral pH is sometimes desirable, in order to fit the taste of a whole range of consumers, beverages with an acidic pH in the range of about pH 4 to about pH 5 may be encompassed. However, as mentioned above, the stability of soluble fibres in solution in acidic medium is very critical and the use of oligosaccharides with a chain
15 length of about 2 to 20 units is not possible because such fibre would undergo rapid hydrolysis thus losing the physiological benefits of such compounds. There remain a need for a water-based beverage that exhibits an acidic pH while containing soluble fibres that remain stable, i.e.
20 not hydrolysed, during long-term storage.

Therefore it is also an other object of the present invention concerns a shelf-stable, clear and acidic pH water composition comprising water and soluble fibres that is characterized by the fact that :

25 -the water may be substantially demineralised or mineralised,

-and the soluble fibres comprise digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000.

30

Maltodextrin results from starch hydrolysis and is a product generally having a Dextrose Equivalent [DE] between 1 and 20 usually produced by the action of α -amylase on gelatinised starch. The commercial product is usually supplied as a free flowing spray-dried powder.

Malto-oligosaccharide is an oligosaccharide containing up to about 10 anhydroglucose units and is found in maltodextrins with high degree of hydrolysis. In the context of the present invention concerning acidic water-beverage in which fructo-oligosaccharide hydrolysis may be an issue, suitable digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000 may be selected from Fibresol® maltodextrin. This product is available on the market from Matsutani Chemical Industry Co., Ltd, Japan. Such a compound comprises about 9 to 12 glucose units and is usually derived from starch that has undergone physical, chemical and enzymatic treatment to render the resultant malto-oligosaccharide indigestible by human enzymes. More specifically corn starch may be treated by dry heat to a temperature of about 160°C in the presence of hydrochloric acid (< 0.15%) and subsequently may be treated with amylolytic enzymes (α -amylase and glucoamylase). The non-digestible dextrin produced may then be separated from the residual enzymes, liberated glucose and low molecular weigh by-products by treatment with activated carbon and fractionation on ion-exchange columns.

It has thus been observed that the use of digestion-resistant malto-oligosaccharides such as Fibresol® for example allows to obtain a water composition with acidic taste that may correspond to a specific consumer expectation and product range while avoiding the

hydrolysis of these fibre components thus preserving the health benefit.

Indeed, an acidic taste, which usually corresponds to a pH range of about 4 to about 5, may particularly fit with water beverages containing additional flavours such as vegetal, herbal and fruity ones for example. In fact, fruits and vegetal in general are usually acid and a basic solving medium does not fit on the taste point of view.

10

Also, the expression "substantially demineralized" means, in the present context, that the water composition according to the present invention has a mineral level of less than about 400 PPM, preferably less than 200 PPM, more preferably less than 100 PPM and even more preferably from about 40 to about 70 PPM.

In the present context, the expression "shelf-stable" means that the water composition according to the present invention can be stored whether at ambient, cold or high (around 37°C) temperature without microbial spoilage, degradation of the oligosaccharides, development of turbidity nor precipitation of the oligosaccharides, even for long time storage like months.

25

On the one hand, under such neutral pH conditions no oligosaccharide chain hydrolysis occurs and all the nutritional benefits of these fibres are kept. On the other hand, the use of digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000 allows the manufacture of acidic pH compositions with out loss of health benefit because of chain hydrolysis. The

30

fibres that are contained in the present water compositions can thus be delivered to the gut microflora without prior hydrolysis and can therefore provide their prebiotic effect.

5

Since the consumption of water is also appreciated chilled it is convenient to store the present water composition at temperature of about 5°C. Interestingly, the water composition according to the present invention containing
10 fibres may be store at such refrigeration temperatures and no precipitation of the dissolved fibre occurs. Such advantage is very interesting because such precipitation would be a definitive drawback regarding consumer acceptance.

15

Moreover, since the oligosaccharides do not undergo hydrolysis, they do not lead to the formation of simple sugars that could alter too much the neutral taste of the composition. However, it can be noticed that the addition
20 of such fibres to water appears to be a convenient way to modify the bitterness, the sweetness, the softness, the astringency, the smoothness and metallic-ness of the water in a way that increases substantially its taste acceptability by consumers. In fact, the selected fibres
25 do exhibit a kind of very slight sweet taste that can contribute to improve the taste of the beverage without increase the caloric value. Indeed, one drawback of low-mineral and demineralized waters is their taste, which is somehow perceived as bland and/or astringent. Moreover, in
30 the case of water-beverage containing aroma, flavours, extracts or any other solute, it is highly desirable to soften the strength of some of them. Thus, the addition of

the selected fibres to low mineral water according to the present invention appears as a good means for providing a great tasting water that is smooth and not astringent and has only just a hint of sweetness.

5

Accordingly, the present invention also concerns a method for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallicness of a neutral or acidic pH and substantially demineralized water by the incorporation of soluble fibres selected in the group comprising oligosaccharides with a chain length of about 2 to 20 units and digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000.

15

As regards to suitable oligosaccharides for neutral pH water compositions according to one aspect of the present invention, these may be chosen in the group comprising fructo-oligosaccharides made of fructose residues linked by $\beta(2-1)$ bonds. The preferred fructo-oligosaccharides exhibit a chain length of around 2 to 20 fructose units, preferably 2 to 15 units and more preferably 2 to 8 fructose units.

20

25

Regarding appearance of the water composition according to the present invention it is to be noticed that this water remains clear and translucent upon storage. Indeed, the specific choice of oligosaccharides with a chain length comprised between 2 and 20 units or digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000 allows avoiding any precipitation during storage.

30

In spite of the fact that the present water composition is intended to be substantially demineralized for purpose of taste, it may also be supplemented with minerals since it has been suprisingly found that the somehow gritty and metallic taste of added minerals observed in mineral-enriched water may be masked by the use of the fibres according to the different aspects of present invention. Suitable minerals may be selected from the group comprising Ca, Mg, Zn or Fe. As mentioned above, the slight sweet taste of both source of fibre allows this hint of sweetness that perfectly fit with the desired use.

Mineral supplementation of the water composition according to the present invention may be achieved by addition of a metastable Calcium Lactate-Citrate or Calcium-Magnesium Lactate-Citrate complex as described in US 6,261,610 whose content is hereby incorporated by mean of reference.

According to consumer preference, the water composition according to the present invention may be supplemented with a whole range of functional ingredients that might include vitamins, antioxidants, plants extracts and flavors such as camomile, tilleul, orange flower or guarurana for example.

Different plants and vegetal extracts are known for their physiological effect for modulating biological functions. Among different physiological functions that may be modulated by plants extract one can cite modulation of blood pressure, increase of fat oxidation, release of stress, increase of digestion effectiveness, mental stimulation, increase of alertness, limitation of free-radicals and skin replenishment for example. Currently,

many oral supplements are available on the market in the form of pills, tablets or herbal preparation for infusion for example. On the one hand, tablets and pills are not well perceived by the consumer since they are regarded as non natural and are too similar to drugs. On the other hand herbal preparation for herb-teas need cumbersome preparation and the taste of the products obtained thereof is not satisfactory. Indeed, herb-teas made with effective plant and vegetal extracts are often bitter and involve addition of significant amounts of sugar which is not always desirable.

There remains a need for food product that provides the benefit of physiological functions modulation through plant extracts but without the drawbacks of the existing products. Moreover, solid food products usually need to be dissolved and/or emulsified in order to cross gut barrier. Therefore a water-based beverage that would provide all the above mentioned benefits would also be much effective in the sense of bioavailability.

The present invention therefore concerns a beverage according to claim ... that also comprise plant extracts selected in the group comprising : aloe vera, blueberry, caffeine, vitamin C, chrysanthemum, green tea guarana hawthorn, and honey, used alone or in combination.

The selection of the above mentioned ingredients allows to deliver the following benefits :

- improvement of heart function and circulation and improvement of oxygen delivering through the blood for the oxidation process
- enhancement of lipolysis or fat breakdown in combination with powerful antioxidants that will protect the body from damage as fat is broken down

- alleviate gastrointestinal dysfunction and associated diarrhea.

More generally, the present invention concerns the use of water-based beverage according to claim ... that allows an
5 increased mental alertness with the consumer thanks to the addition of at least one stimulant and at least one blood circulating increasing agent. Suitable blood circulating increasing agent may be selected in the group comprising hawthorn and blueberry.

10 The present invention also concerns the use of water-based beverage according to claim ... for improving skin health and skin elasticity thanks to the addition of skin rejuvenant and skin strengthening ingredient such as aloe vera extract and/or vitamine C. In the last case, the
15 combination of selected fibre with aloe vera allows a synergistic effect of both ingredients in the sense that the fibres improve the absorption of aloe vera extract thus acting from the inside and not only topically as known from prior art.

20

Accordingly, the present invention also concerns the use of soluble fibres comprising oligosaccharides with a chain length of about 2 to 20 units for modifying the
25 bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH mineral-enriched water.

According to an other embodiment, the present invention
30 concerns the use of soluble fibres comprising digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000 for modifying the bitterness, the sweetness,

the softness, the astringency, the smoothness as well as the metallic-ness of an acidic pH mineral-enriched water.

5 Due to the high stability of the fibres contained in the water compositions according to the present invention, all the benefits of soluble fibres can be delivered to consumers in a simple, direct and convenient way, i.e. by simply opening a bottle of the water according to the
10 present invention and drinking said water composition. Such bottled water is able to be stored at ambient temperature for a long time without adverse effects on the intrinsic properties and benefits that are delivered by the contained fibres.

15 Indeed, the present water composition, through delivering of fibres presents a means to deliver all the nutritional benefits of fibres, namely :

- 20 - improvement and increase of intestinal microflora (especially Bifidobacterium),
- short chain fatty acids production through fermentation of the fibres by the intestinal microflora,
- increase of faecal volume as well as faecal frequencies,
- 25 - moderation of post-prandial rise in blood glucose level for healthy human subjects (when the water consumption is associated with ingestion of a meal or a snack for example),
- prevention of intestinal mucosal atrophy in
30 case of long-term enteral nutrition,
- favourable effects on serum cholesterol and triglycerides levels.

In order to manufacture the water composition according to the present invention without compromising the nutritional benefit of fibres and in order to ensure complete shelf-stability of the product, a soft manufacturing process may be achieved.

Such manufacturing process may comprise the following steps :

- providing a syrup comprising from 10 to 30% by weight of soluble fibres in water,

- filtering the said obtained syrup through a filter with a pore size sufficiently small to exclude at least 99.9% of the bacteria, fungi, molds and spores,

- providing a neutral or acidic pH and substantially demineralized or mineralized water,

- filtering the said water through a filter with a pore size sufficiently small to exclude about 99.9 of the bacteria, fungi, molds and spores,

- treating the filtered water with Ozone in order to reduce the total microflora to about 0 cfu/ml (colony forming unit/ml) of water,

- mixing the filtered and ozonated water with the filtered syrup under aseptic condition in order to obtain the water composition according to the present invention,

- filling sterile bottles with the water composition in an ultra clean environment.

The filtration of both syrup and water may be achieved by means known by the skilled in the art, through membrane

filter with pore size of around 0.2 to 0.5 μm , for example.

The ozonation of water may be achieved by bubbling ozone into the water in order to reach a level of about 0.1 to 1 PPM ozone.

A sterile filling may be achieved using plastic bottles and caps that are sterilized prior to filling whether by ozonation or thanks to H_2O_2 , for example. The filling takes place in an ultra clean environment.

Alternately the product may be manufactured using an ultra high temperature process to sterilize the materials and subsequently filling under aseptic conditions.

15

EXAMPLE 1

Manufacture of water composition with oligofructosaccharides.

20

A sterile syrup is prepared according to the following procedure :

A concentrated oligofructose syrup with an average degree of polymerization of 10 (10 fructose units) is dissolved in water in order to obtain two syrups containing 15 and 30% by weight of oligofructose. The thus obtained syrups are filtered through a membrane-filter equipped with 0.2 μm pores.

The sterilization of the syrups is checked by total aerobic microflora count and table 1 shows a complete elimination of viable microflora.

30

Water Samples	Before Filtration (cfu/ml)	After Filtration (cfu/ml)
30% oligofructose - DP 10	164	0
15% oligofructose - DP 10	17	0

TABLE 1- Microbial counts of filtrated oligofructose syrup.

Sterile water is prepared according to the following procedure :

Water with a mineral content of 75 PPM and a pH of 6.5 is filtered through a 0.2 μ m pores membrane filter.

The filtered water is then ozonated by bubbling ozone gas into it in order to dissolve 0.8-1.0 PPM ozone in the water and obtain a final ozone content in finished product of a minimum of 0.2 PPM immediately following filling.

Then, both sterile mixtures (syrup and water) are mixed in line under sterile condition and filled in an ultra clean environment (minimum class 100 conditions) or aseptically to obtain a final concentration of fibres (oligosaccharides) of 4 g/l.

The bottles may be stored for several weeks even months without microbial development, without off-taste apparition, no oligossaccharide hydrolysis nor appearance of any coloration. Alternatively, the bottled water containing fibres may also be store at refrigeration temperature and no precipitation of the dissolved fibre occurs.

EXAMPLE 2**5 Organoleptic assessment of the water containing fibre.**

A panel of 22 consumers in the age group of 25-60 was asked to rate the taste, smell and appearance of the following water compositions :

10 Water composition according to example 1 stored at different temperature versus low mineral spring water. The results of the test are showed in Table 2.

It is clear that the water composition according to the present invention is highly preferred compared to

15 classical spring water.

It can be noticed that for both cases, the differences between the samples are clearly perceived and the organoleptic descriptors used for differentiating the

20 products are very positive. The water composition according to the present invention has an improved taste being smoother and not perceived as astringent compared to the spring water.

25

30

TABLE 2 : Consumer acceptance and organoleptic features of the composition according to the invention.

Group 1	water sample of example 1 kept at room temperature	milky, a little bit sweet, fruity, taste perceived, little flavor of cameral, , mouthfeel is round & soft, yoghurt taste	21 of 22 person can feel the difference	the two products are different at 0.1% level
	low mineral spring water	sweet, neutral, bitter, a little bit sour, astringent, metallic, aftertaste is bitter		
Group 2	water sample of example 1 kept in 37°C	sweet, milky, fruity, cameral, aroma is like candy , sweet , chlorine, yoghurt taste, maybe not fresh	17 of 22 person cab feel the difference	the two products are different at 5% level
	low mineral spring water	bitter, neutral, fermented, slight moudly flavor, normal,		

5

Subsequently larger scale trials were conducted with more than 200 consumers and the product was preferred 65:35 against a low mineralized water.

CLAIMS

1. Shelf-stable, clear and neutral pH water composition comprising water and soluble fibres that is characterized
5 by the fact that :

- the water is substantially demineralized
- and the soluble fibres comprise oligosaccharides with a chain length of about 2 to 20 units.

10

2. Water composition according to claim 1, characterized in that oligosaccharides are chosen in the group comprising fructo-oligosaccharides made of fructose residues linked by $\beta(2-1)$ bonds.

15

3. Water composition according to claim 1, characterized in that the fibres quantity contained in the water composition ranges from 0.1 to 10 grams of fibres per litre of water.

20

4. Method for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH and substantially demineralized water by the incorporation of soluble fibres
25 comprising oligosaccharides with a chain length of about 2 to 20 units.

30

5. Use of soluble fibres comprising oligosaccharides with a chain length of about 2 to 20 units for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH mineral-enriched water.

6. Shelf-stable, clear and acidic pH water composition comprising water and soluble fibres that is characterized by the fact that :

- 5 - the soluble fibres comprise digestion-resistant malto-oligosaccharides with a Molecular Weight of about 2000.

7. Composition according to claim 6, further comprising at
10 least one ingredient selected in the group comprising :
vegetal extract, herbal and fruity extract used alone or
in combination.

8. Use of a composition according to claim 7, for
15 effecting at least one of the following physiological
modulations : modulation of blood pressure, increase of
fat oxidation, release of stress, increase of digestion
effectiveness, mental stimulation, increase of alertness,
limitation of free-radicals and skin replenishment.

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Yujing Rivere Garden Villa, East Side of Baixinzhuang
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(CN). LAUPIE, Marc [FR/FR]; 10, rue des Mésanges,
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(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,

SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii)) for the following designations AE,
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES,
FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH,
PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN,
TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO
patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU,
TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT,
RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- as to the applicant's entitlement to claim the priority of the
earlier application (Rule 4.17(iii)) for the following desig-
nations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY,
BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC,
EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA,
MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW,
ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD,
RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL,
PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI,
CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- of inventorship (Rule 4.17(iv)) for US only

Published:

- with international search report

(88) Date of publication of the international search report:
14 October 2004

[Continued on next page]

(54) Title: WATER BEVERAGE CONTAINING FIBRES

(57) Abstract: The present invention relates to a water-based beverage containing soluble fibres. The water composition is substan-
tially demineralized and has a neutral or acidic pH. The soluble fibres contained in the present water composition are selected from
a group comprising oligosaccharides with a chain length of from about 2 to 20 units and digestion-resistant malto-oligosaccharides
with a Molecular Weight of about 2000. The present water composition may be store without adverse effect such as hydrolysis of
oligosaccharides nor precipitation of the soluble fibres contained in it.

WO 2004/023898 A3



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

Inte .pplication No
PLI/EP 03/09999

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23L1/308 A23L1/09 A23L1/304 A23L2/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal, WPI Data, PAJ, FSTA, MEDLINE, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No. .
X	US 6 248 390 B1 (STILLMAN SUZANNE JAFFE) 19 June 2001 (2001-06-19) cited in the application column 4, line 40 - column 5, line 25 column 6, line 7 - line 31 column 7, line 17 - line 33 example 2	1-3
Y	claims 6,9,13	4,5
Y	BERRY D.: "Hiding Healthful Ingredients" FOOD PRODUCT DESIGN, [Online] May 2002 (2002-05), XP002230318 3400 Dundee Rd. Suite #100, IL, US Retrieved from the Internet: URL:http://www.ba1chem.com/news/articles/A pplicationsFPD0502.pdf> [retrieved on 2003-02-05] page 6 - page 7	4,5
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

2 February 2004

Date of mailing of the international search report

02.07.2004

Name and mailing address of the ISA

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Authorized officer

Popa, M

INTERNATIONAL SEARCH REPORT

 Intern: Application No
 PCT/EP 03/09999

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 660 872 A (BOOTEN KARL ET AL) 26 August 1997 (1997-08-26) column 5, line 10 - line 18 column 6, line 51 - column 7, line 5 examples 1,2; tables 1,2 -----	1-3
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 09, 13 October 2000 (2000-10-13) & JP 2000 157233 A (NARITA TOMOTAKA), 13 June 2000 (2000-06-13) abstract -----	1,2,4
X	US 4 978 751 A (BITON JACQUES ET AL) 18 December 1990 (1990-12-18) example 1 column 2, line 64 - column 3, line 5 -----	1-3
X	US 6 004 610 A (TROUP JOHN P ET AL) 21 December 1999 (1999-12-21) the whole document -----	1
A	EP 0 307 523 A (YAKULT HONSHA KK) 22 March 1989 (1989-03-22) examples 1,3 -----	1,3,5
A	US 6 436 446 B1 (FORUSZ SAMUEL L ET AL) 20 August 2002 (2002-08-20) column 1, line 58 - column 2, line 22 claims; examples -----	1-3
A	DE 201 06 845 U (RATS APOTHEKE DR WOLFGANG ALBR) 8 November 2001 (2001-11-08) page 2, line 17 - line 27; claims -----	1-3
A	EP 0 951 844 A (BERNER HANS GUENTER) 27 October 1999 (1999-10-27) page 2; claims -----	1-3
A	NINESS K.R.: "Inulin and Oligofructose: What are They?" THE JOURNAL OF NUTRITION, [Online] vol. 129, no. 7 Suppl., July 1999 (1999-07), pages 1402S-1406S, XP002230319 American Society for Nutritional Sciences, US ISSN: 0022-3166 Retrieved from the Internet: URL:http://www.nutrition.org/contents-by-d ate.0.shtml> [retrieved on 2003-02-04] the whole document -----	1-5
	----- -/--	

INTERNATIONAL SEARCH REPORT

International Application No

PC 1/LR 03/09999

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No. *
A	<p>ROBERFROID M.B., DELZENE N.M.: "Dietary fructans" ANNUAL REVIEW OF NUTRITION, ANNUAL REVIEWS INC., PALO ALTO, CA, US, vol. 18, 1998, pages 117-143, XP002123057 ISSN: 0199-9885</p> <p style="text-align: center;">-----</p>	

INTERNATIONAL SEARCH REPORT

In onal application No.
PCT/EP 03/09999

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/ EP 03/ 09999

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

Neutral water composition comprising demineralised water and soluble fibers that contain oligosacharides with a chain length of 2-20 units

2. claims: 6-8

Acidic water composition comprising water and soluble fibers that comprise maltooligosaccharides with a MW of about 2000

INTERNATIONAL SEARCH REPORT

nation on patent family members

Intern Application No

PCT/EP 03/09999

Patent document cited in search report.		Publication date	Patent family member(s)	Publication date
US 6248390	B1	19-06-2001	AU 3982101 A	03-09-2001
			BR 0108534 A	22-04-2003
			CA 2399918 A1	30-08-2001
			CN 1404364 T	19-03-2003
			EP 1259128 A1	27-11-2002
			JP 2003534777 T	25-11-2003
			WO 0162108 A1	30-08-2001

US 5660872	A	26-08-1997	BE 1006377 A3	09-08-1994
			AU 5459694 A	22-06-1994
			WO 9412541 A1	09-06-1994
			DE 69320982 D1	15-10-1998
			DE 69320982 T2	08-04-1999
			EP 0670850 A1	13-09-1995
			ES 2122218 T3	16-12-1998

JP 2000157233	A	13-06-2000	NONE	

US 4978751	A	18-12-1990	FR 2629985 A1	20-10-1989
			AT 86441 T	15-03-1993
			AU 634469 B2	25-02-1993
			AU 3274489 A	19-10-1989
			CA 1340744 C	14-09-1999
			DE 68905217 D1	15-04-1993
			DE 68905217 T3	06-02-1997
			DK 172489 A	15-10-1989
			EP 0337889 A1	18-10-1989
			ES 2039083 T3	16-08-1993
			FI 891763 A ,B,	15-10-1989
			GR 3007598 T3	31-08-1993
			GR 3020576 T3	31-10-1996
			JP 1311090 A	15-12-1989
			JP 2919851 B2	19-07-1999
			KR 126679 B1	26-12-1997
			NZ 228731 A	26-03-1992
			US 5366962 A	22-11-1994

US 6004610	A	21-12-1999	NONE	

EP 0307523	A	22-03-1989	CA 1324529 C	23-11-1993
			US 4859488 A	22-08-1989
			EP 0307523 A1	22-03-1989
			AU 624065 B2	04-06-1992
			AU 7815587 A	09-03-1989
			DE 3785035 D1	29-04-1993
			DE 3785035 T2	01-07-1993
			JP 1845639 C	25-05-1994
			JP 3042876 B	28-06-1991
			JP 62220169 A	28-09-1987

US 6436446	B1	20-08-2002	CA 2331185 A1	16-07-2002
			US 2002172724 A1	21-11-2002

DE 20106845	U	08-11-2001	DE 20106845 U1	08-11-2001

EP 0951844	A	27-10-1999	DE 19817877 A1	18-11-1999
			AT 233492 T	15-03-2003
			DE 59904414 D1	10-04-2003

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern

Application No

PCT/EP 03/09999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0951844	A	DK 951844 T3	07-07-2003
		EP 0951844 A2	27-10-1999
		ES 2190144 T3	16-07-2003
		PT 951844 T	31-12-2003

PCT

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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference NO 7403/WO/PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/09999	International filing date (day/month/year) 09.09.2003	Priority date (day/month/year) 10.09.2002
International Patent Classification (IPC) or both national classification and IPC A23L1/308		
Applicant NESTEC S.A. et al.		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 6 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of sheets.
- This report contains indications relating to the following items:

I	<input checked="" type="checkbox"/>	Basis of the opinion
II	<input type="checkbox"/>	Priority
III	<input type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	<input checked="" type="checkbox"/>	Lack of unity of invention
V	<input checked="" type="checkbox"/>	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	<input type="checkbox"/>	Certain documents cited
VII	<input type="checkbox"/>	Certain defects in the international application
VIII	<input type="checkbox"/>	Certain observations on the international application

Date of submission of the demand 19.01.2004	Date of completion of this report 27.01.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Popa, M Telephone No. +49 89 2399-7829 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/09999

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-18 as originally filed

Claims, Numbers

1-8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP 03/09999

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☐ all parts.
- ☒ the parts relating to claims Nos. 1-5 .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	4,5
	No: Claims	1-3
Inventive step (IS)	Yes: Claims	
	No: Claims	4,5
Industrial applicability (IA)	Yes: Claims	1-5
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1:** US-B1-6 248 390 (STILLMAN SUZANNE JAFFE) 19 June 2001
- D2:** NINESS K.R.: 'Inulin and Oligofructose: What are They?' THE JOURNAL OF NUTRITION, vol. 129, no. 7 Suppl., July 1999, pages 1402S-1406S, XP002230319
- D3:** ROBERFROID M.B., DELZENE N.M.: 'Dietary fructans' ANNUAL REVIEW OF NUTRITION, ANNUAL REVIEWS INC., PALO ALTO, CA, US, vol. 18, 1998, pages 117-143, XP002123057 ISSN: 0199-9885
- D4:** BERRY D.: 'Hiding Healthful Ingredients' FOOD PRODUCT DESIGN, [Online] May 2002 (2002-05), XP002230318
- D5:** US-A-5 660 872 (BOOTEN KARL ET AL) 26 August 1997
- D6:** PATENT ABSTRACTS OF JAPAN vol. 2000, no. 09, 13 October 2000 & JP 2000 157233 A (NARITA TOMOTAKA), 13 June 2000
- D7:** US-A-4 978 751 (BITON JACQUES ET AL) 18 December 1990
- D8:** US-A-6 004 610 (TROUP JOHN P ET AL) 21 December 1999

2. This application covers 2 distinct inventions. As only the first invention (claims 1-5) has been subject to a search report, this examination report concerns only the aforementioned claims. This invention also seems to represent the main invention, in the sense of Art. 34(3)(c) PCT.

3. This application has been found to have deficiencies that contravene the PCT requirements.

3.1. *Shelf-stable* in claim 1 is regarded to be merely a descriptive feature as it cannot have a technical character in the sense used in this application. Moreover, since the term of *shelf-stable* can be used to describe different types of parameters (microbiologic, functional, organoleptic, physico-chemical), the presence of such a feature in the claims can lead to unclarities concerning the scope of the claims.

The same applies to *clear*.

3.2. *Substantially* and *about* are vague features that cannot be used to distinguish the alleged invention from the prior art provided the other features are simultaneously present. The affected claims are 1, 4 and 5.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/09999

3.3. Therefore, the claims were analysed with the features mentioned above (§3.1-3.2) being excised from the claims. This removal was made solely for the purpose of examination and not as an amendment or correction (Rule 66.8(a) PCT).

4. Present application does not meet the requirement of Art. 33(1) PCT because the subject-matter of all examined claims is not new in the sense of Art. 33(2) and/or does not involve an inventive step in the sense of Art. 33(3) PCT.

4.1. Document **D1** discloses (the references in parentheses applying to this document) a shelf-stable (see §3.1), essentially tasteless and odourless water-like composition (c. 6 l. 7-31; c. 7 l. 17-33) comprising oligosaccharides in form of starch hydrolysates or oligofructans (c. 5 l. 8-25) and water low in minerals (c. 5 l. 8-25), i.e. containing less than 500 mg/l dissolved salts. Said oligofructans inherited the $\beta(2-1)$ bonds of inulin and **D2** (p. 1402S) and **D3** (Table 1) confirms the value of DP of inulin and FOS.

D1's composition contains between 0.1 and 10% of said fibres.

There is no reason to believe the prior art composition deviates from a neutral pH (especially when the limits describing such a pH are largely stated in this application).

As a consequence, claims **1-3** do not meet the requirements of Art. 33(2) PCT for lack of novelty in their subject-matter.

5. This application does not meet the requirements of Art. 33(1) PCT because the subject-matter of claims **4** and **5** does not involve an inventive step in the sense of Art. 33(3) PCT.

5.1. **D4** is considered to be the closest prior art document regarding the independent claim **4**. **D4** discloses one potential use of inulin and FOS: taste modifiers (i.e. overall taste improving). **D4** says (chapter **Inulin improves overall taste**) that the short chain fructans interact with the taste buds and this behaviour modifies the taste perception. For this reason, FOS and inulin have been already employed in different beverages (masking off-flavours).

The difference between the disclosure of **D4** and the alleged invention of claim **4** consists in the carrier: neutral pH and demineralised water vs. beverages comprising different other ingredients. Thus, the objective problem to be solved can be formulated as how can one apply the taste modification teachings to a different carrier.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/09999

Such carriers have been already used in **D1** (see §4.1) in combination with FOS and/or inulin to produce a water-like composition that shows, implicitly, a slight rise of sweetness. Furthermore, D4 prompts a person skilled in the art to use inulin/FOS in beverages for masking the aftertaste and/or off-flavours (i.e. for modifying the perception of several fundamental tastes).

Such a change comes within the scope of the customary practice followed by the skilled persons, especially as the advantages thus achieved can be readily contemplated in advance.

The same reasoning equally applies for the independent claim 5.

As consequence, the subject-matter of the independent claims 4 and 5 lacks an inventive step in the sense of Art 33(3) PCT.

* * *

Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)
The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

**Declaration of inventorship (Rules 4.17(iv) and 51bis.1(a)(iv))
 for the purposes of the designation of the United States of America:**

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/..... (if furnishing declaration pursuant to Rule 26ter).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications: .02078735.4. dated. 10.09.2002

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Citizenship: UK

Inventor's Signature: [Signature]

(if not contained in the request, or if declaration is corrected or added under Rule 26ter after the filing of the international application. The signature must be that of the inventor, not that of the agent)

Date: 2003.11.14

(of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26ter after the filing of the international application)

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Inventor's Signature: [Signature]

(if not contained in the request, or if declaration is corrected or added under Rule 26ter after the filing of the international application. The signature must be that of the inventor, not that of the agent)

Date: 2003-11-14

(of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26ter after the filing of the international application)

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".

Continuation of Box No. VIII (i) to (v) DECLARATION

If the space is insufficient in any of Boxes Nos. VIII (i) to (v) to furnish all the information, including in the case where more than two inventors are to be named in Box No. VIII (iv), in such case, write "Continuation of Box No. VIII ..." (indicate the item number of the Box) and furnish the information in the same manner as required for the purposes of the Box in which the space was insufficient. If additional space is needed in respect of two or more declarations, a separate continuation box must be used for each such declaration. If this Box is not used, this sheet should not be included in the request.

Continuation of Box VIII (iv) DECLARATION : INVENTORSHIP

Name : CLYDE Gene Frank

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Mihang District, PRC-201107 Shanghai

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Date : 14 Nov. 2003

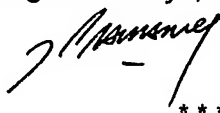
Name : DAWANCE Jean-Pierre

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Date : 07 Nov 2003

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Citizenship : US

Inventor's signature :

Date :

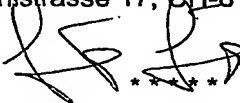
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Date : 14 Nov 2003

Continuation of Box No. VIII (i) to (v) DECLARATION

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Continuation of Box VIII (iv) DECLARATION : INVENTORSHIP

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Date :

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Continuation of Box VIII (iv) DECLARATION : INVENTORSHIP

Name : CLYDE Gene Frank

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Date :